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EFFECTS OF CHANGING LEVELS OF UV RADIATION ON PLANT AND TIMBER PRODUCTION

Paper presented by the Food and Agriculture Organization of the United Nations (FAO)

Summary

The ozone layer is the principal shield preventing harmful short-wave ultraviolet radiation from reaching the surface of the earth. Suggestions that man's activities may be leading to a moderate reduction of the stratospheric ozone layer is of justifiable concern. Several threats such as exhaust emissions from high altitude aircraft and halomethanes diffusing up from the troposphere appear to have a sound theoretical support to serve as a basis of concern. Several other threats such as a contribution of NO_2 to the stratosphere from the widespread use of nitrogen fertilizers are more questionable though of sufficient magnitude to warrant further investigation. The several potential causes of stratospheric ozone reduction would have more or less additive effects. Ozone reduction would take place over long periods of time and would not be quickly reversible.

The threat to higher plants used in agriculture and timber production is of particular concern since plants have evolved to be efficient collectors of solar radiation which is of necessity in effective photosynthetic energy capture. This also maximizes exposure of plant leaves and shoots to solar UV radiation. Any threat to plant productivity, no matter how subtle, is of concern in view of the existing global demands for food and fiber production.

Unfortunately, it is presently impossible to predict the magnitude of the effect on plant life due to any particular stratospheric ozone reduction. Most of the effects on plants are of a detrimental nature. However, the increased UV radiation that would occur with moderate reduction in stratospheric ozone concentrations would probably result in rather subtle effects on plants. Therefore, it is very difficult to quantitatively assess the overall magnitude of the potential threat - particularly when contemplating global crop production or the productivity from forests. Even though many effects would be subtle, this does not lessen the cause for concern, particularly when a perturbation of global proportions and long time constants is being considered. This paper will present a problem statement as to the nature of the effects presently anticipated and attempt to bring this threat into context relative to the natural fluctuations to ozone that are already known to occur.

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